Claims

1. A method of allocating or controlling the amount of bits for the encoding of source data, including:

(i) defining the target bit rate for the encoding of the data;

(ii) defining collections of coefficients of the data;

(iii) defining a first global coding order of the said collections of coefficients;

(iv) defining a plurality of coding units and corresponding allowable truncation points for each said collection of coefficients;

(v) defining a second local coding order of the said coding units for each said collections of coefficients;

(vi) defining a rate value and a distortion value for each said coding unit of each said collection of coefficients;

(vii) defining a threshold value for each said coding unit of each said collection of coefficients;

wherein, starting from the first coding unit according to the said local coding order of a said collection of coefficients, if a predetermined termination criterion is not met for a coding unit, the said coding unit will be included in the output code-stream, if the said termination criterion is met, the encoding of the collection of coefficients is terminated and no further coding unit according to the said local coding order of the said collection of coefficients will be encoded.

2. A method as claimed in claim 1 wherein said collections of coefficients of the data are code-blocks.

3. A method according to claim 1 in which the said rate value is the amount of bits needed to encode the said coding unit, or a first neighboring coding unit according to the local coding order, of the said collection of coefficients and the said distortion value is the distortion reduction due to the encoding of the said coding unit of the said collection of coefficients, or the encoding of a second neighboring coding unit according to the local coding order of the said collection of coefficients.

4. A method according to claim 3 in which a rate-distortion value is computed from the said rate value and the said distortion value for each said coding unit of each said collection of coefficients, and the said termination criterion is that the rate-distortion value is below a threshold.

5. A method according to claim 4 in which the said rate-distortion value is a fractional number with the denominator being the said rate value and the numerator being the said distortion value for each said coding unit of each said collection of coefficients.

6. A method according to claim 4 in which the said rate-distortion value is a fractional number with the denominator being the said rate value and the numerator being the said distortion value for each said coding unit.

7. A method according to any of claims 4 to 6 in which the threshold value is a predetermined constant common to all the collections of coefficients or can be different values such that a predetermined value is common to all the coding units of a collection of coefficients, or can be different values for different collections of coefficients and different coding units.

8. A method according to any of claims 4 to 6 in which the threshold value is a fractional number with the denominator being the difference between the target bit rate and the total amount of bits used to encode all the past code-blocks according to the global coding order and all the earlier coding units of

the current collection of coefficients according to the local coding order, and the numerator being the amount of distortion if the encoding terminates at that coding unit or a neighboring coding unit according to the local coding order.

9. A method according to any of claims 4 to 6 in which the threshold value is the product of (a) a fractional number with the denominator being the difference between the target bit rate and the total amount of bits used to encode all the past collections of coefficients according to the global coding order and all the earlier coding units of the current collection of coefficients according to the local coding order, and the numerator being the product of the amount of distortion if the encoding terminates at that coding unit, or a neighboring unit according to the local coding order, and (b) an additional weighting factor.

10. A method according to claim 1 in which the collections of coefficients are the code-blocks of coefficients of the source data in the data transform domain.

11. A method according to claim 1 in which the collections of coefficients are the code-blocks of coefficients in the data transform domain, and the coding unit can be any intermediate coding pass.

12. A method according to claim 11 wherein the data transform domain is the discrete wavelet domain in JPEG2000 and the intermediate coding pass is the significance pass, refinement pass or cleanup pass of JPEG2000.

13. A method according to claim 1 in which the collections of coefficients are the code-blocks of coefficients in the data transform domain, and the coding order is predefined.

14. A method according to claim 1 in which the collections of coefficients are the code-blocks of coefficients in the data transform domain of data formed by the difference of a first source data and a second source data.

15. A method of allocating or controlling the amount of bits for the encoding of source data, including:

(i) defining the target bit rate for the encoding of the data;

(ii) defining collections of coefficients of the source data in the source data domain or in a data transform domain;

(iii) defining a first global coding order of the said collections of coefficients;

(iv) defining a plurality of coding units and corresponding allowable truncation points for each said collection of coefficients;

(v) defining a second local coding order of the said coding units for each said collection of coefficients;

(vi) defining a priority level of each said collection of coefficients;

(vii) defining a global priority level for the said data;

wherein, starting with the global priority level being the highest priority level among all collections of coefficients, all the collections of coefficients are examined one at a time, wherein for a collection of coefficients with priority level equal to the global priority level, the first un-encoded coding unit according to the local coding order is encoded and the priority level of the said collection of coefficients is reduced by one, wherein after all the collections of coefficients are examined, the global priority level is decreased by one and all the collections of coefficients are examined again, and the process continues iteratively until it terminates when the total amount of bits used is greater than the target bit rate, or when all the details of all the collections of coefficients have been encoded.

16. A method as claimed in claim 15 wherein in the case of termination when the total bits exceed the target bit rate, the last coding units being encoded immediately before the total bits exceed the target bit rate may or may not be removed from the output code-stream. .

17. A method as claimed in claim 15 wherein in the case of termination when the total bits exceed the target bit rate, some additional un-encoded coding units of some code-blocks may or may not be encoded.

18. A method as claimed in claim 15 wherein said collections of coefficients are code-blocks of coefficients in a data transform domain.

19. A method of allocating or controlling the amount of bits for the encoding of source data, including:

(i) defining the target bit rate for the encoding of the data;

(ii) defining collections of coefficients of the source data;

(iii) defining a first global coding order of the said collections of coefficients;

(iv) defining a plurality of coding units and corresponding allowable truncation points for each said collection of coefficients;

(v) defining a second local coding order of the said coding units for each said collection of coefficients;

(vi) defining a priority level of each said collection of coefficients;

(vii) defining a rate-distortion value for each said coding unit of each said collection of coefficients;

wherein, starting with the current priority level being the highest priority level among all collections of coefficients, all the collections of coefficients are

examined one at a time, wherein for a collection of coefficients with a priority level equal to the current priority level, the first un-encoded coding unit according to the local coding order is encoded and the priority level of the said collection of coefficients is reduced by one, wherein after all the collections of coefficients are examined, the current priority level is decreased by one and all the collections of coefficients are examined again, and the process continues iteratively until the total amount of bits used is greater than the target bit rate and the encoded coding unit with the least rate-distortion slope is removed and wherein this process is repeated until the total amount of bits used is less than or equal to the target bit rate.

20. A method of allocating or controlling the amount of bits for the encoding of source data, including:

(i) defining the target bit rate for the encoding of the source data;

(ii) defining collections of coefficients of the source data;

(iii) defining a first global coding order of the said collections of coefficients;

(iv) defining a plurality of coding units and corresponding allowable truncation points for each said collection of coefficients;

(v) defining a second local coding order of the said coding units for each said collection of coefficients;

(vi) defining a priority level of each said collection of coefficients;

(vii) defining a rate-distortion value for each said coding unit of each said collection of coefficients;

wherein, starting with the current priority level being the highest priority level among all collections of coefficients, all the collections of coefficients are

examined one at a time, wherein for a collection of coefficients with priority level equal to the current priority level, the first un-encoded coding unit according to the local coding order is encoded and the priority level of the said collection of coefficients is reduced by one, wherein after all the collections of coefficients are examined, the current priority level is decreased by one and all the collections of coefficients are examined again, and the process continues iteratively until the total amount of bits used is greater than the target bit rate at which point the global minimum rate-distortion slope among all the coding units of all the collections of coefficients is found and more encoding is performed in all the collections of coefficients, and wherein for each collection of coefficients, all the un-encoded coding units are encoded according to the local coding order until the rate-distortion slope is smaller than the global minimum rate-distortion slope and then the rate-distortion optimised rate-distortion slope is computed and used to select the optimal truncation for the coding units.

21. A method according to claim 19 or 20 wherein the rate-distortion slope is a function of the rate value which is the amount of bits needed to encode the said coding unit, or a first neighboring coding unit according to the local coding order of the said collection of coefficients and the distortion value is the distortion reduction due to the encoding of the said coding unit of the said collection of coefficients, or the encoding of a second neighboring coding unit according to the local coding order of the said collection of coefficients.

22. A method according to claim 21 wherein the rate-distortion value is a fractional number with the denominator being the said rate value and the numerator being the said distortion value for each said coding unit.

23. A method according to claim 21 wherein the rate-distortion value is a fractional number with the denominator being the said rate value and the

numerator being the said distortion value for each said coding unit, multiplied by a scaling factor value.

24. A method according to any of claims 14 to 18 in which the code-blocks are examined according to the global coding order.

25. A method according to any of claims 19 to 24 in which the priority level of each said code-block is equal to the total number of coding units needed to fully specify the said code-block.

26. A method according to any of claims 19 to 24 in which the collections of coefficients are the code-blocks of coefficients in the discrete wavelet transform domain of the image or image tile, and the coding unit can be the significance pass, refinement pass or cleanup pass of JPEG2000.

27. A method according to any of claims 19 to 21 in which the priority level of each said code-block is a linear function of the total number of bit planes needed to fully describe the wavelet coefficients.

28. A software product for allocating or controlling the amount of bits for the encoding of source data, said software product including means for enabling the steps of:

(i) defining the target bit rate for the encoding of the data;

(ii) defining collections of coefficients of the data;

(iii) defining a first coding order of the said collections of coefficients;

(iv) defining a plurality of coding units and corresponding allowable truncation points for each said collection of coefficients;

(v) defining a second coding order of the said coding units for each said collection of coefficients;

(vi) defining a rate value and a distortion value for each said coding unit of each said collection of coefficients;

(vii) defining a threshold value for each said coding unit of each said collection of coefficients;

wherein said software product operates such that, starting from the first coding unit according to the said local coding order of a said collection of coefficients, if a predetermined termination criterion is not met for a coding unit, the said coding unit will be included in the output code-stream, if the said termination criterion is met, the encoding of the collection of coefficients is terminated and no further coding unit according to the said local coding order of the said collection of coefficients will be encoded.

29. A software product as claimed in claim 28 wherein said collections of coefficients of the data are code-blocks.

30. A software product as claimed in claim 28 in which the said rate value is the amount of bits needed to encode the said coding unit, or a first neighboring coding unit according to the local coding order, of the said collection of coefficients and the said distortion value is the distortion reduction due to the encoding of the said coding unit of the said collection of coefficients, or the encoding of a second neighboring coding unit according to the local coding order of the said collection of coefficients.

31. A software product according to claim 30 in which a rate-distortion value is computed from the said rate value and the said distortion value for each said coding unit of each said collection of coefficients, and the said termination criterion is that the rate-distortion value is below a threshold.

32. A software product according to claim 31 in which the said rate-distortion value is a fractional number with the denominator being the said

rate value and the numerator being the said distortion value for each said coding unit of each said collection of coefficients.

33. A software product according to claim 31 in which the said rate-distortion value is a fractional number with the denominator being the said rate value and the numerator being the said distortion value for each said coding unit.

34. A software product according to any of claims 31 to 33 in which the threshold value is a predetermined constant common to all the collections of coefficients or can be different values such that a predetermined value is common to all the coding units of a collection of coefficients, or can be different values for different collections of coefficients and different coding units.

35. A software product method according to any of claims 31 to 33 in which the threshold value is a fractional number with the denominator being the difference between the target bit rate and the total amount of bits used to encode all the past code-blocks according to the global coding order and all the earlier coding units of the current collection of coefficients according to the local coding order, and the numerator being the amount of distortion if the encoding terminates at that coding unit or a neighboring coding unit according to the local coding order.

36. A software product according to any of claims 31 to 33 in which the threshold value is the product of (a) a fractional number with the denominator being the difference between the target bit rate and the total amount of bits used to encode all the past collections of coefficients according to the global coding order and all the earlier coding units of the current collection of coefficients according to the local coding order, and the numerator being the product of the amount of distortion if the encoding terminates at that coding

unit, or a neighboring unit according to the local coding order, and (b) an additional weighting factor.

37. A software product according to claim 28 in which the collections of coefficients are the code-blocks of coefficients of the source data in the data transform domain.

38. A software product according to claim 28 in which the collections of coefficients are the code-blocks of coefficients in the data transform domain, and the coding unit can be any intermediate coding pass.

39. A method according to claim 38 wherein the data transform domain is the discrete wavelet domain in JPEG2000 and the intermediate coding pass is the significance pass, refinement pass or cleanup pass of JPEG2000.

40. A software product according to claim 28 in which the collections of coefficients are the code-blocks of coefficients in the data transform domain, and the coding order is predefined.

41. A software product according to claim 28 in which the collections of coefficients are the code-blocks of coefficients in the data transform domain of data formed by the difference of a first source data and a second source data.

42. A software product for allocating or controlling the amount of bits for the encoding of source data, said software product including means for enabling the steps of:

(i) defining the target bit rate for the encoding of the data;

(ii) defining collections of coefficients of the source data in the source data domain or in a data transform domain;

(iii) defining a first global coding order of the said collections of coefficients;

(iv) defining a plurality of coding units and corresponding allowable truncation points for each said collection of coefficients;

(v) defining a second local coding order of the said coding units for each said collection of coefficients;

(vi) defining a priority level of each said collection of coefficients;

(vii) defining a global priority level for the said data;

wherein said software product operates such that, starting with the global priority level being the highest priority level among all collections of coefficients, all the collections of coefficients are examined one at a time, wherein for a collection of coefficients with priority level equal to the global priority level, the first un-encoded coding unit according to the local coding order is encoded and the priority level of the said collection of coefficients is reduced by one, wherein after all the collections of coefficients are examined, the global priority level is decreased by one and all the collections of coefficients are examined again, and the process continues iteratively until it terminates when the total amount of bits used is greater than the target bit rate, or when all the details of all the collections of coefficients have been encoded.

43. A software product as claimed in claim 42 wherein in the case of termination when the total bits exceed the target bit rate, the last coding units being encoded immediately before the total bits exceed the target bit rate may or may not be removed from the output code-stream. .

44. A software product as claimed in claim 42 wherein in the case of termination when the total bits exceed the target bit rate, some additional un-encoded coding units of some code-blocks may or may not be encoded.

45. A software product as claimed in claim 42 wherein said collections of coefficients are code-blocks of coefficients in a data transform domain.

46. A software product for allocating or controlling the amount of bits for the encoding of source data, said software product including means for:

(i) defining the target bit rate for the encoding of the data;

(ii) defining collections of coefficients of the source data;

(iii) defining a first global coding order of the said collections of coefficients;

(iv) defining a plurality of coding units and corresponding allowable truncation points for each said collection of coefficients;

(v) defining a second local coding order of the said coding units for each said collection of coefficients;

(vi) defining a priority level of each said collection of coefficients;

(vii) defining a rate-distortion value for each said coding unit of each said collection of coefficients;

wherein said software product operates such that, starting with the current priority level being the highest priority level among all collections of coefficients, all the collections of coefficients are examined one at a time, wherein for a collection of coefficients with a priority level equal to the current priority level, the first un-encoded coding unit according to the local coding order is encoded and the priority level of the said collection of coefficients is reduced by one, wherein after all the collections of coefficients are examined, the current priority level is decreased by one and all the collections of coefficients are examined again, and the process continues iteratively until the total amount of bits used is greater than the target bit rate and the encoded

coding unit with the least rate-distortion slope is removed and wherein this process is repeated until the total amount of bits used is less than or equal to the target bit rate.

47. A software product for allocating or controlling the amount of bits for the encoding of source data, said software product including means for enabling the steps of:

(i) defining the target bit rate for the encoding of the data;

(ii) defining collections of coefficients of the source data;

(iii) defining a first global coding order of the said collections of coefficients;

(iv) defining a plurality of coding units and corresponding allowable truncation points for each said collection of coefficients;

(v) defining a second local coding order of the said coding units for each said collection of coefficients;

(vi) defining a priority level of each said collection of coefficients;

(vii) defining a rate-distortion value for each said coding unit of each said collection of coefficients;

wherein said software product operates such that, starting with the current priority level being the highest priority level among all collections of coefficients, all the collections of coefficients are examined one at a time, wherein for a code-block with priority level equal to the current priority level, the first un-encoded coding unit according to the local coding order is encoded and the priority level of the said collection of coefficients is reduced by one, wherein after all the collections of coefficients are examined, the current priority level is decreased by one and all the collections of coefficients

are examined again, and the process continues iteratively until the total amount of bits used is greater than the target bit rate at which point the global minimum rate-distortion slope among all the coding units of all the collections of coefficients is found and more encoding is performed in all the collections of coefficients, and wherein for each collection of coefficients, all the un-encoded coding units are encoded according to the local coding order until the rate-distortion slope is smaller than the global minimum rate-distortion slope and then the rate-distortion optimised rate-distortion slope is computed and used to select the optimal truncation for the coding units.

48. A software product according to claim 46 or 47 wherein the rate-distortion slope is a function of the rate value which is the amount of bits needed to encode the said coding unit, or a first neighboring coding unit according to the local coding order of the said collection of coefficients and the distortion value is the distortion reduction due to the encoding of the said coding unit of the said collection of coefficients, or the encoding of a second neighboring coding unit according to the local coding order of the said collection of coefficients.

49. A software product according to claim 48 wherein the rate-distortion value is a fractional number with the denominator being the said rate value and the numerator being the said distortion value for each said coding unit.

50. A software product according to claim 48 wherein the rate-distortion value is a fractional number with the denominator being the said rate value and the numerator being the said distortion value for each said coding unit, multiplied by a scaling factor value.

51. A software product according to any of claims 41 to 45 in which the code-blocks are examined according to the global coding order.

52. A software product according to any of claims 46 to 51 in which the priority level of each said code-block is equal to the total number of coding units needed to fully specify the said code-block.

53. A software product according to any of claims 46 to 51 in which the collections of coefficients are the code-blocks of coefficients in the discrete wavelet transform domain of the image or image tile, and the coding unit can be the significance pass, refinement pass or cleanup pass of JPEG2000.

54. A software product according to any of claims 46 to 48 in which the priority level of each said code-block is a linear function of the total number of bit planes needed to fully describe the wavelet coefficients.

55. Apparatus for allocating or controlling the amount of bits for the encoding of source data, said software product including means for enabling the steps of:

(i) defining the target bit rate for the encoding of the data;

(ii) defining collections of coefficients of the data;

(iii) defining a first coding order of the said collections of coefficients;

(iv) defining a plurality of coding units and corresponding allowable truncation points for each said collection of coefficients;

(v) defining a second coding order of the said coding units for each said collection of coefficients;

(vi) defining a rate value and a distortion value for each said coding unit of each said collection of coefficients;

(vii) defining a threshold value for each said coding unit of each said collection of coefficients;

wherein said apparatus operates such that, starting from the first coding unit according to the said local coding order of a said collection of coefficients, if a predetermined termination criterion is not met for a coding unit, the said coding unit will be included in the output code-stream, if the said termination criterion is met, the encoding of the collection of coefficients is terminated and no further coding unit according to the said local coding order of the said collection of coefficients will be encoded.

56. Apparatus as claimed in claim 55 wherein said collections of coefficients of the data are code-blocks.

57. Apparatus as claimed in claim 55 in which the said rate value is the amount of bits needed to encode the said coding unit, or a first neighboring coding unit according to the local coding order, of the said collection of coefficients and the said distortion value is the distortion reduction due to the encoding of the said coding unit of the said collection of coefficients, or the encoding of a second neighboring coding unit according to the local coding order of the said collection of coefficients.

58. Apparatus as claimed in claim 57 in which a rate-distortion value is computed from the said rate value and the said distortion value for each said coding unit of each said collection of coefficients, and the said termination criterion is that the rate-distortion value is below a threshold.

59. Apparatus as claimed in claim 58 in which the said rate-distortion value is a fractional number with the denominator being the said rate value and the numerator being the said distortion value for each said coding unit of each said collection of coefficients.

60. Apparatus as claimed in claim 58 in which the said rate-distortion value is a fractional number with the denominator being the said rate value and the numerator being the said distortion value for each said coding unit.

61. Apparatus as claimed in any of claims 58 to 60 in which the threshold value is a predetermined constant common to all the collections of coefficients or can be different values such that a predetermined value is common to all the coding units of a collection of coefficients, or can be different values for different collections of coefficients and different coding units.

62. Apparatus as claimed in any of claims 58 to 60 in which the threshold value is a fractional number with the denominator being the difference between the target bit rate and the total amount of bits used to encode all the past code-blocks according to the global coding order and all the earlier coding units of the current collection of coefficients according to the local coding order, and the numerator being the amount of distortion if the encoding terminates at that coding unit or a neighboring coding unit according to the local coding order.

63. Apparatus as claimed in any of claims 58 to 60 in which the threshold value is the product of (a) a fractional number with the denominator being the difference between the target bit rate and the total amount of bits used to encode all the past collections of coefficients according to the global coding order and all the earlier coding units of the current collection of coefficients according to the local coding order, and the numerator being the product of the amount of distortion if the encoding terminates at that coding unit, or a neighboring unit according to the local coding order, and (b) an additional weighting factor.

64. Apparatus as claimed in claim 55 in which the collections of coefficients are the code-blocks of coefficients of the source data in the data transform domain.

65. Apparatus as claimed in claim 55 in which the collections of coefficients are the code-blocks of coefficients in the data transform domain, and the coding unit can be any intermediate coding pass.

66. Apparatus as claimed in claim 65 wherein the data transform domain is the discrete wavelet domain in JPEG2000 and the intermediate coding pass is the significance pass, refinement pass or cleanup pass of JPEG2000.

67. Apparatus as claimed in claim 55 in which the collections of coefficients are the code-blocks of coefficients in the data transform domain, and the coding order is predefined.

68. Apparatus as claimed in claim 55 in which the collections of coefficients are the code-blocks of coefficients in the data transform domain of data formed by the difference of a first source data and a second source data.

69. Apparatus for allocating or controlling the amount of bits for the encoding of source data, said apparatus including means for enabling the steps of:

(i) defining the target bit rate for the encoding of the data;

(ii) defining collections of coefficients of the source data in the source data domain or in a data transform domain;

(iii) defining a first global coding order of the said collections of coefficients;

(iv) defining a plurality of coding units and corresponding allowable truncation points for each said collection of coefficients;

(v) defining a second local coding order of the said coding units for each said collection of coefficients;

(vi) defining a priority level of each said collection of coefficients;

(vii) defining a global priority level for the said data;

wherein said apparatus operates such that, starting with the global priority level being the highest priority level among all collections of coefficients, all the collections of coefficients are examined one at a time, wherein for a collection of coefficients with priority level equal to the global priority level, the first un-encoded coding unit according to the local coding order is encoded and the priority level of the said collection of coefficients is reduced by one, wherein after all the collections of coefficients are examined, the global priority level is decreased by one and all the collections of coefficients are examined again, and the process continues iteratively until it terminates when the total amount of bits used is greater than the target bit rate, or when all the details of all the collections of coefficients have been encoded.

70. Apparatus as claimed in claim 69 wherein in the case of termination when the total bits exceed the target bit rate, the last coding units being encoded immediately before the total bits exceed the target bit rate may or may not be removed from the output code-stream. .

71. Apparatus as claimed in claim 69 wherein in the case of termination when the total bits exceed the target bit rate, some additional un-encoded coding units of some code-blocks may or may not be encoded.

72. Apparatus as claimed in claim 69 wherein said collections of coefficients are code-blocks of coefficients in a data transform domain.

73. Apparatus for allocating or controlling the amount of bits for the encoding of source data, said apparatus including means for:

(i) defining the target bit rate for the encoding of the data;

(ii) defining collections of coefficients of the source data;

(iii) defining a first global coding order of the said collections of coefficients;

(iv) defining a plurality of coding units and corresponding allowable truncation points for each said collection of coefficients;

(v) defining a second local coding order of the said coding units for each said collection of coefficients;

(vi) defining a priority level of each said collection of coefficients;

(vii) defining a rate-distortion value for each said coding unit of each said collection of coefficients;

wherein said apparatus operates such that, starting with the current priority level being the highest priority level among all collections of coefficients, all the collections of coefficients are examined one at a time, wherein for a collection of coefficients with a priority level equal to the current priority level, the first un-encoded coding unit according to the local coding order is encoded and the priority level of the said collection of coefficients is reduced by one, wherein after all the collections of coefficients are examined, the current priority level is decreased by one and all the collections of coefficients are examined again, and the process continues iteratively until the total amount of bits used is greater than the target bit rate and the encoded coding unit with the least rate-distortion slope is removed and wherein this process is repeated until the total amount of bits used is less than or equal to the target bit rate.

74. Apparatus for allocating or controlling the amount of bits for the encoding of source data, said apparatus including means for enabling the steps of:

(i) defining the target bit rate for the encoding of the data;

(ii) defining collections of coefficients of the source data;

(iii) defining a first global coding order of the said collections of coefficients;

(iv) defining a plurality of coding units and corresponding allowable truncation points for each said collection of coefficients;

(v) defining a second local coding order of the said coding units for each said collection of coefficients;

(vi) defining a priority level of each said collection of coefficients;

(vii) defining a rate-distortion value for each said coding unit of each said collection of coefficients;

wherein said apparatus operates such that, starting with the current priority level being the highest priority level among all collections of coefficients, all the collections of coefficients are examined one at a time, wherein for a code-block with priority level equal to the current priority level, the first un-encoded coding unit according to the local coding order is encoded and the priority level of the said collection of coefficients is reduced by one, wherein after all the collections of coefficients are examined, the current priority level is decreased by one and all the collections of coefficients are examined again, and the process continues iteratively until the total amount of bits used is greater than the target bit rate at which point the global minimum rate-distortion slope among all the coding units of all the collections of coefficients is found and more encoding is performed in all the collections of coefficients, and wherein for each collection of coefficients, all the un-encoded coding units are encoded according to the local coding order until the rate-distortion slope is smaller than the global minimum rate-distortion slope and then the rate-distortion optimised rate-distortion slope is computed and used to select the optimal truncation for the coding units.

75. Apparatus according to claim 73 or 74 wherein the rate-distortion slope is a function of the rate value which is the amount of bits needed to encode the said coding unit, or a first neighboring coding unit according to the local coding order of the said collection of coefficients and the distortion value is the distortion reduction due to the encoding of the said coding unit of the said collection of coefficients, or the encoding of a second neighboring coding unit according to the local coding order of the said collection of coefficients.

76. Apparatus as claimed in claim 75 wherein the rate-distortion value is a fractional number with the denominator being the said rate value and the numerator being the said distortion value for each said coding unit.

77. Apparatus as claimed in claim 75 wherein the rate-distortion value is a fractional number with the denominator being the said rate value and the numerator being the said distortion value for each said coding unit, multiplied by a scaling factor value.

78. Apparatus as claimed in any of claims 68 to 72 in which the code-blocks are examined according to the global coding order.

79. Apparatus as claimed in any of claims 73 to 78 in which the priority level of each said code-block is equal to the total number of coding units needed to fully specify the said code-block.

80. Apparatus as claimed in any of claims 73 to 78 in which the collections of coefficients are the code-blocks of coefficients in the discrete wavelet transform domain of the image or image tile, and the coding unit can be the significance pass, refinement pass or cleanup pass of JPEG2000.

81. Apparatus as claimed in any of claims 73 to 75 in which the priority level of each said code-block is a linear function of the total number of bit planes needed to fully describe the wavelet coefficients.